Solving and Graphing Practical Situations with Inequalities

STRAND: Patterns, Functions and Algebra

STRAND CONCEPT: Solving Inequalities

SOL: 6.14ab, 7.13, 8.18

Remediation Plan Summary

Students will represent and solve multi-step inequalities involving practical situations and graph the solutions on a number line.

Common Errors and Misconceptions

- Students have difficulty understanding, writing, and graphing the inequality both ways (i.e. m<6 and 6>m).
- Students have trouble making sense of such terms as "at least" and "at most."
- Students use "tricks" to help them figure out which direction to shade the number line without conceptually understanding the meaning of the inequality.
- Students have difficulty with knowing when to switch the inequality sign when multiplying or dividing the inequality by a negative number.
- Students have difficulty using multiple steps to solve the inequality and make mistakes with integer operations.

Materials

- Individual student white boards
- Dry-erase markers
- Copies of Large Questions and Answers for Rotation Activity, folded in half
- Clipboards

Introductory Activity

Write the following equation on the board, $3(x - 2) + 5 = 6x - 2$, and ask the students to solve the equation on their whiteboards. Review with the students the steps for solving multi-step equations, as well as the distributive property and other properties that are applied while solving. After most students have a solution, have a volunteer student (who has the correct answer of $x = \frac{1}{3}$ and, if possible, subtracted 6*x* from both sides of the equation when solving) present his/her problem-solving method. Ask all students to graph this answer (a single point) on a number line.

Plan for Instruction

1. Throughout this lesson, remind students that they are using the properties of real numbers and the properties of inequality when solving.
2. In the above introductory problem, replace the equal sign with a $\leq$, and ask students to discuss how this will change the answer. Students should indicate that there will be multiple solutions, not just one. Ask students to predict whether the solution to the inequality will be shaded to the left (assuming most will predict as symbol is $\leq$) or right on the number line as well as determine whether $\frac{1}{3}$ will still be part of the solution set and why. Have students test a point from the predicted solution set.

3. Model for students the steps to solve the inequality and relate them to the steps the student used to solve the equation. Emphasize the need to reverse the sign of the inequality when dividing by a negative number and or when rewriting $\frac{1}{3} \leq x$ to $x \geq \frac{1}{3}$. Ask students to graph the solution. Were their predictions correct? Ask students to give two values that are in the solution set and two that are not. Explain why the inequality change directions when dividing by a negative.

4. Provide students with additional multistep inequalities to solve and graph the solution on their whiteboards. Here is a sample list from the curriculum framework: $2x + 1 > \frac{-x}{4}$; $-3(2x + 7) \leq \frac{1}{2}x$; $2x + 7 - 5x < 27$; $-5x - (x + 3) > -12$.

5. Tell the students that they will be doing a rotation activity to practice these skills. Post the folded rotation problems through-out the classroom. Provide the students with a clipboard to lean on as they complete their work, or allow them to lean on a book. Each student will start at a different problem. Set the timer for 3 to 4 minutes. Students work to solve their problems in the allotted time. When the timer rings, the students rotate to the next question. They check the answer to the question they just completed, and then start the next question. Set timer again. Repeat this process for all eight questions. Monitor students and assist as necessary. For students who finish their problem before the timer rings, provide them with an extra review or practice sheet to work on while they are waiting.

Pulling It All Together (Reflection)

Provide students with a graphed solution of an inequality on a number line, and have them write the inequality indicated by the graph, and at least three solutions that are graphed. Ask them to create a real life situation that can result in the same solution.

For extra practice the students can complete the inequality practice sheet.

Note: The following pages are intended for classroom use for students as a visual aid to learning

Virginia Department of Education 2018

Rotation Questions Student Work and Answer Sheet

Name_____

1)	2)
3)	4)
5)	6)
7)	8)

Answer: #8) $m > \dfrac{1}{3}$

1)

$$-8(p+3) \leq 16$$

Answer: #1) $p \geq -5$

2)

$$b - 7b + 2 < 10 - 12$$

Answer: #2) $p < -\dfrac{2}{3}$

3)

$$15 \geq \frac{5}{3}(h-6)$$

Answer: #3) $15 \geq h$

4) You are renting a car for a day. There is a daily charge of $20 and a fee of $0.75 per mile. You can spend a maximum of $65.00. Write and solve an inequality that represents the number of miles you can drive the car that day.

Answer: #4) $20 + 0.75m \leq 65$
$m \leq 60$

5)

$$12x - 3 \geq 5x - 60 + 8$$

Answer: #5) $x \geq -7$

6)

$$30 \leq -7.5(k - 4.2)$$

Answer: #6) $0.2 \le k$

7) Your weekly salary at a computer store is $160. You earn $20 for each laptop you sell. The maximum you can earn each week is $1000. Write and solve an inequality to find the number of computers you can sell each week.

Answer: #7) $160 + 20p \le 1000$

$p \le 42$

8)

$$2m + \frac{1}{3} > 1$$